Special Act 05-07
Connecticut Clean Diesel Plan

On-Road Fleets Subcommittee Report

I. Introduction

Over 21,000 tons of fine particulate matter are emitted in Connecticut each year. These emissions come from a wide variety of sources including on-road and off-road diesel trucks and buses, the combustion of distillate oil and wood for heating, stationary engines, and portable engines. These sources also emit other pollutants that contribute to Connecticut's air quality problems. For example, on-road engines account for about 58 percent of the over 118,000 tons of nitrogen oxides emitted annually in Connecticut, off-road engines about 20 percent, with the remaining 22 percent from stationary and area sources.

The General Assembly has directed the Department of Environmental Protection (DEP), pursuant to Special Act 05-07[1], to develop a Connecticut clean diesel plan to reduce the health risks from diesel pollution and to help the state meet federal air quality standards for fine particulate matter.

The DEP began the planning on July 19, 2005 with a kick-off meeting at DEP's offices. As a result of this meeting, four subcommittees were formed to explore and develop information on the following sectors: on-road fleets, transit buses, school buses and off-road construction equipment. Each group, comprised of the government, private industry, public health and the environmental sectors, was provided a set of action items and directed to report back to DEP. The on-road fleets subcommittee was directed to examine the following issues:

- State-wide baseline;
- Evaluate fleet retrofit, replacement retirement options;
- Evaluate clean fuel options;
- Anti-idling;
- Leveraging opportunities;
- Case studies –pilot projects; and
- Other Items identified by the subcommittee.

On August 17, 2005, the DEP hosted a Diesel Emissions Reduction Policy, Technology and Clean Fuels Forum. The forum was intended to inform the DEP's efforts to develop the Connecticut Clean Diesel Plan by providing experts on policy, control technology and clean fuels the opportunity to present information to all interested stakeholders. Much of the information received through this public input process is relevant to each of the four subcommittees and serves to inform several aspects of this report.

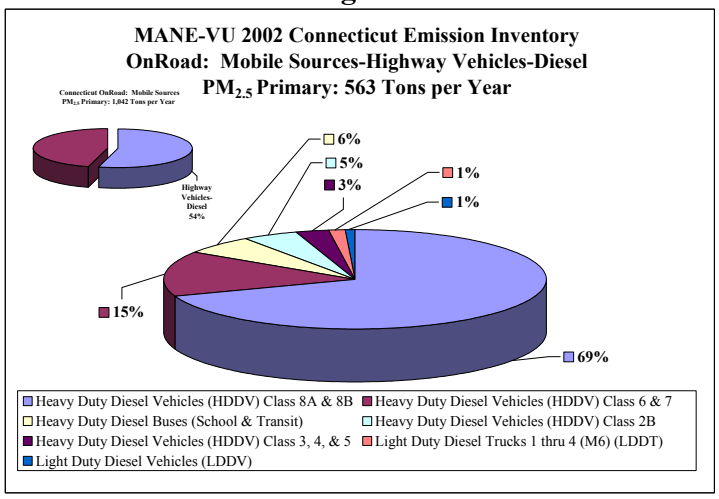
II. On-Road Fleets Report

A. State-wide baseline:

[1] See Attachment 1, Special Act 05-07, *An Act Establishing A Connecticut Clean Diesel Plan*.

Figure 1 below represents a projection of the particulate matter ($PM_{2.5}$) emissions from on-road diesel-powered vehicles. In Connecticut, on-road heavy-duty diesel vehicles account for 92% of the total emissions of fine $PM_{2.5}$ or almost 518 tons per year.

Figure 1



With respect to oxides of nitrogen (NO_X), a precursor to ground level ozone, heavy-duty diesel vehicles over 10,000 pounds gross vehicle weight emit 25,115 tons of NO_X per year. This is approximately 22% of all NO_X emitted in Connecticut each year.

The Department of Motor Vehicles (DMV) provided baseline inventory data on the number of commercial vehicles over 14,000 pounds gross vehicle weight rating registered in Connecticut. This information is provided in Table 1 by gross weight group and in Table 2 by fleet distribution for each model year. DMV noted that the data provided did not include state or municipally owned and operated vehicles.[2]

Table 1

COMMERCIAL (CC 02) OVER 14,000 AND OVER PER WEIGHT GROUP	
Group Total	**Gross Weight Group**
0	LESS THAN 5,000
0	5,000 to 7,999
0	8,000 to 9,999
0	10,000 to 11,999
0	12,000 to 13,999
6,974	14,000 to 15,999
3,772	16,000 to 17,999
1,408	18,000 to 19,999
645	20,000 to 21,999
863	22,000 to 23,999
4,083	24,000 to 25,999
1,772	26,000 to 27,999
799	28,000 to 29,999

[2] Municipalities are not required to assign municipal license plates to specific vehicles. DMV provided an example that a municipal license plate could be on a police car one day and a garbage truck the next. To accurately determine the number of municipally owned and operated heavy-duty vehicles, DEP would need to either inspect each municipality or otherwise conduct a specific inquiry. DEP did not possess the resources to do so within the timeframes imposed by Special Act 05-07.

663	30,000 to 31,999
6,787	32,000 to 35,999
344	36,000 to 39,999
256	40,000 to 44,999
333	45,000 to 49,999
2,721	50,000 to 54,999
292	55,000 to 59,999
646	60,000 to 64,999
1.085	65,000 to 69,999
1,969	70,000 to 74,999
2,018	75,000 to 79,999
4,921	80,000 AND OVER
42,351	**Total**

Highlighted information indicates that 42% of the on-road fleet is between 10,000 pounds and 26,000 pounds. Currently, this portion of the fleet is not subject to any emissions testing.

Table 2

COMMERCIAL (CC 02) OVER 14,000 AND OVER PER WEIGHT GROUP	
Vehicle Year	**Vehicle Count**
1908 – 1980 combined	2,490
1981	315
1982	233
1983	281
1984	512
1985	768
1986	952
1987	1402
1988	1496
1989	1089
1990	933
1991	671
1992	733
1993	947
1994	1287
1995	2055
1996	1511
1997	1988
1998	1915
1999	3236
2000	3,595
2001	3,280
2002	2,270
2003	2,260
2004	2,768
2005	2,659
2006	705
Total	**42,351**

Table 3

placeholder for ConnDOT fleet information

The inventory compiled as part of the diesel planning effort provides a useful first step but would require additional refinement to serve as an effective tool for designing comprehensive diesel emission reduction strategies for Connecticut's on-road fleet. The following discussion provides an overview of programs currently in place designed to reduce emission from on-road diesel vehicles. This provides a useful starting point for considering future program enhancements.

Heavy Duty Diesel Inspection and Maintenance

Pursuant to the Connecticut General Statutes section 14-164i, Connecticut established a roadside emissions testing program for heavy-duty diesel vehicles greater than 26,000 gross vehicle weight rating (school buses are exempt). Due to the regional nature of air pollution and the multi-state operation of many on-road fleets, DMV implements on-road testing in conjunction with other Northeast states including New York, Massachusetts, New Jersey and Rhode Island The emission testing is done in conjunction with safety or weight inspections performed by the Department of Motor Vehicles (DMV). The emission test is conducted by measuring the smoke emitted by a heavy-duty diesel vehicle using an opacity meter. Those vehicles with smoke opacity exceeding the standards are required to be repaired. This program while limited to resource constraints can effectively target gross emitters. Under the current roadside emissions testing utilizing DMV's limited resources, three DMV inspectors test about 2,000 heavy-duty diesel vehicles per year.

In an effort to increase the numbers of vehicles tested annually, and utilize limited resources more efficiently, the DMV has recently established a self-testing for fleets or dealers having ten or more heavy-duty diesel vehicles. Using the same procedures and standards as the roadside emission testing program, owners or dealers can self-certify their vehicles meet the Connecticut opacity standards. The environmental benefits and from the self-certification can be further enhanced through the adoption of tighter standards implemented throughout the Northeast. Consistent regional standards will provide regulatory certainty and will greatly streamline administrative processes by providing reciprocity for testing throughout the Northeast. Efforts are currently underway to coordinate implementation of more stringent opacity standards throughout the NESCAUM region.

Heavy Duty Diesel Engine-Not to Exceed Standards

In 2003 DEP adopted Section 22a-174-36a of the Regulations of State Agencies (Section 36a) in order to fill the time gap in federal regulation of heavy duty diesel engines (HDDE) and close a loophole that would have allowed dirtier heavy-duty diesel engines to be built during the 2005 and 2006 model years that could increase diesel exhaust emissions nationally by as much as 800,000 tons over the lifetime of the offending engines – *the equivalent of 30 million cars*. Section 36a requires that any new vehicles equipped with heavy-duty diesel engines of model years 2006 and beyond sold or otherwise transferred in Connecticut must first be certified for sale under California's emission control program.

DEP has estimated that this regulation will prevent a total of 1200 tons of excess NO_x emissions in calendar years 2005 and 2006 combined. Additional substantial increases would be expected for as long as these diesel engines remained in use, up to thirty years. The cost effectiveness of the proposed diesel regulation is estimated to be at the lower-end of other DEP measures to

reduce NO_X emissions. EPA and California have estimated the lifetime cost to manufacture a clean 2005 and 2006 model year diesel engine to be approximately $800.[3]

DMV will ensure compliance through the vehicle registration process. DMV will make registration of HDDEs contingent on the registrant possessing a valid manufacturer's certificate of origin stating that the subject engine is approved by CARB for sale in the State of California. Thus, the state will ensure reporting and enforcement of the requirements of Section 36a. The penalty for failure to possess the necessary documentation is a denial of registration. DMV enforcement will ensure that these emissions reductions will be realized.

Heavy Duty Diesel Engine-Chip Reflash Program

Another program strategy to consider is chip reflash. In the mid-1990s, the United States Department of Justice (US DOJ), EPA, and the California Air Resources Board (CARB) discovered that the seven major engine manufacturers had designed their 1993 through 1998 model heavy-duty diesel engines to operate with advanced electronic engine controls that resulted in excessive nitrogen oxide (NOx) emissions. Approximately 1.3 million engines were produced and calibrated to "pass" the US EPA heavy-duty diesel engine dynamometer certification test in the laboratory. However, when these engines were operated in the vehicle under "real world" conditions, the electronic calibration would change, altering the fuel delivery characteristics and causing elevated NOx levels. From its investigation, in October 1998, DOJ, EPA and ARB announced completion of separate Consent Decrees (CD) with each of these seven heavy-duty engine manufacturers. The companies included Caterpillar, Cummins, Detroit Diesel, Mack Trucks, Navistar International, Renault, and Volvo.

Under the provisions of the CDs, the manufacturers are required to provide to their dealers modified software (the "Low-NOx Rebuild Kit" or "chip reflash") that reduces the extent of the injection timing advance that causes the excess NOx emissions. The dealers are to install the kits at the time the vehicle is brought in for a major engine rebuild/overhaul.

The rate of reflash has been considerably lower than what was envisioned under the CDs; the primary reason being that engine rebuilds occur at considerably higher elapsed vehicle mileage than what was contemplated when the CDs were negotiated. In response to this unacceptably low reflash rate, ARB has adopted a mandatory program, not tied to the time of rebuild, but rather to a prescribed period by which owners must bring their vehicles into the dealer to have the reflash operation performed, with all costs borne by the engine manufacturers.

All of the northeast states are also concerned that chip reflash has not occurred at the projected rate and are now considering a mandatory program, modeled after the California program. The following table illustrates the potential NOx emissions (tons per day) that could be reduced in the Northeast if the states adopt a reflash program.

State	NOx Reductions tons per day (TPD) from in-state registered vehicles
Connecticut	3.5

[3] California Air Resources Board, *Staff Report and Initial Statement of Reasons on Amendment to Adopt NTE and ESC Emission Test Procedures for the 2005 and Subsequent Model Year Heavy-Duty Diesel Engines* (October 20, 2000) at 34.

Maine	1.4
Massachusetts	6.7
New Hampshire	2.0
New Jersey	9.7
New York	16.1
Rhode Island	0.8
Vermont	0.9
Northeast Total	41.1

NESCAUM is in the process of developing a model "reflash" rule, DEP will continue to evaluate this as a potential reduction strategy.

Anti Idling and Truck Stop Electrification

Each year, U.S. trucks consume more than 800 million gallons of diesel fuel—without even moving. Truckers idle their engines while they rest for a variety of reasons, including heating or cooling, preventing start-up problems, or to operate electrical equipment. Conserving diesel fuel that would otherwise be idled away represents an opportunity to reduce petroleum consumption. Studies have shown that a typical long-haul tractor-trailer idles approximately 1,830 hours per year. Across the industry, this practice consumes more than 800 million gallons of diesel fuel annually, approximately 8 million gallons in Connecticut. Excessive idling also contributes to air pollution and noise. Although many states, including Connecticut, have enacted laws and regulations to reduce idling, truckers must also comply with federal mandatory rest requirements and many states, including Connecticut. At times there are limitations that make compliance with federal rest requirements and anti-idling provisions difficult. EPA has developed a draft model rule that provides a useful blueprint for considering additional enhancement to existing anti-idling efforts. DEP will continue to partner with EPA in evaluating various models that could enhance Connecticut's existing efforts.

This year DEP partnered with Secondi Bros. Truck Stop in Milford, CT to secure funding from EPA to begin the construction of an idle-free corridor through the state by the successful use Advanced Truck Stop Electrification (ATSE) technology . The Secondi site is a well-situated truck stop facility located at the confluence of interstates I-95 and I-91, the most traveled area in Connecticut, and one of the most traveled in the northeast. Because this area is a primary transportation corridor between New England and the rest of the country, it is an ideal location for such a project. The potential health benefits from reducing diesel emissions in a state with nonattainment areas for both 8-hour ozone and $PM_{2.5}$ are also strong considerations for investing in idle reduction technology in this location and for developing an idle free corridor in the state. DEP will continue to pursue funding opportunities as this represents an effective diesel reduction strategy for Connecticut's on-road fleet.

The following discussion provides a general overview of potential implementation options put forward as part of the stakeholder process. Additional research and analysis will assist greatly in refining the options for future consideration.

B. Evaluation of Fleet Retrofit, Replacement Retirement Options

Information provided at the Diesel Emissions Reduction Policy, Technology and Clean Fuels Forum indicated there are several technologies available to reduce in-use emissions from on-road

heavy-duty diesel vehicles. This information is available at:
http://www.dep.state.ct.us/air2/diesel/techforum17aug05.htm

In addition to information provided by various stakeholders at the Diesel Emissions Reduction Policy, Technology and Clean Fuels Forum, the DEP received a memorandum dated November 10,2005, from Environment Northeast (ENE) outlining policy mechanisms, estimated costs and benefits and implementation options to reduce diesel PM emissions from waste collection vehicles in Connecticut.[4] Solid waste collection vehicles (SWCVs) are heavy diesel-powered trucks that produce the normal range of pollutants associated with heavy-duty diesel engines. In addition, the lift and crush mechanisms increase the operational time of the diesel engines and vehicle idle time in residential neighborhoods and at disposal facilities. These special characteristics of SWCVs increase their emissions and the resultant danger to public health.

New Haven, alone, operates 18 SWCVs; the statewide fleet is estimated to be 1,200 SWCVs. Many of these concentrate their activities in urban areas where levels of air pollution are already elevated due to other air pollution sources. Controlling emissions from SWCVs would help to reduce exposure to diesel emissions. According to ENE, waste vehicles should be prioritized for retro-fit or re-powering because they:

- Travel at low speeds and idle frequently in neighborhoods and commercial centers directly exposing people to their exhaust;
- Operate in significant numbers in urban areas where diesel emission reductions should be prioritized; and
- Are likely to be either publicly owned or privately owned but under public contract.

ENE identified three models on which a Connecticut plan could be based to substantially reduce emissions from waste collection vehicles. These models are:

- **The California model,**[5] under which the "best available control technology" (BACT) requirement is applied to all 12,000 public and private waste collection vehicles on a phase-in basis by 2010;
- **The New Jersey model**, under which the "best available retrofit technology" (BART) is applied to all 2180 publicly owned or publicly contracted waste collection vehicles beginning in 2007; and
- **The New York City model**,[6] under which an estimated 2,500 waste collection vehicles under city contract must use ULSD and meet a BACT standard by March 1, 2006 (publicly owned waste collection vehicles must implement BACT on a phase-in basis by 2012.

ENE notes that prior to developing a plan and choosing an appropriate model for Connecticut, DEP must complete an inventory of waste collection vehicles, specifically including the following information:

- Total number of waste collection vehicles;
- Vehicle owner and operating location;
- Engine model year and manufacturer; and
- General duty-cycle information.

[4] Environment Northeast, Waste Collection Vehicles Options Memo, November 10, 2005, see Attachment A.

[5] More details of the CARB model can be found at www.arb.ca.gov/msprog/SWCV/SWCV.htm.

[6] New York City's local laws 39 and 40 can be found at http://www.nyccouncil.info/pdf_files/bills/law05039.pdf and http://www.nyccouncil.info/pdf_files/bills/law05040.pdf.

In its memo, ENE projects that retrofitting all the SWCVs in the state with diesel particulate filters, the most effective and costly aftermarket emissions control technology, would cost up to $9 million and have a cumulative benefit of reducing up to 100 tons of PM emissions.[7]

C. Evaluation of Clean Fuel Options

In addition to information provided by various stakeholders at the Diesel Emissions Reduction Policy, Technology and Clean Fuels Forum, the DEP received a memorandum dated November 17, 2005, from Connecticut's Clean Cities coordinators. The memorandum, entitled "Incorporating Alternative Fuel Vehicles into Connecticut's Diesel Mitigation Plan" provided background information on the Clean Cities program, a summary of Connecticut's alternative fuel vehicle (AFV) programs, highlights of current AFV fleets in Connecticut, and highlights of other state alternate fuel vehicle programs. The Clean Cities coordinator's memorandum also contained specific recommendations for inclusion into the On-road fleets portion of the diesel plan.

The Clean Cities program[8] is a Department of Energy voluntary program established by the 1992 Energy Policy Act to advance the nation's economic, environmental, and energy security by supporting local decisions, the effect of which contributes to the reduction of petroleum consumption by on-road vehicles. Clean Cities carries out this mission through a network of eighty-eight volunteer coalitions across the USAThe state of Connecticut has four "Clean Cities": Greater New Haven, Southwest Connecticut, Capital Area, and Norwich.

According to the US Department of Energy, Connecticut is currently home to 1106 Compressed Natural Gas (CNG), 52 dedicated electric, and 648 Flexible Fuel Ethanol Vehicles[9]. The State is also home to 4 biodiesel stations (1-New Haven and 3-CT DOT), which dispense B20, a blend of 20% vegetable oil and 80% conventional diesel fuel. Connecticut Clean Cities estimates that the current AFV programs in the state are responsible for displacing approximately 75,000 gallons of diesel fuel annually[10]. The diesel displacement figures are based on the use of heavy duty natural gas vehicles in Fairfield Trumbull, Stratford and Norwich, the use of dedicated electric trolleys in New Haven, and the Connecticut Department of Transportation's (DOT's) statewide use of B20.

While the 1992 Energy Policy Act defines numerous fuels as "alternative fuels", the most viable and widespread alternative fuels in use in Connecticut to date have been CNG and biodiesel. The future potential to increase the use of these fuels is seen as a short term and long term replacement for conventional diesel fuel.

Natural Gas is a high-quality fuel that is a viable substitute for gasoline and diesel. Nearly 90% of the natural gas consumed in the US is from domestic sources, compared to less than 50% of the oil. Historically CNG, has been less costly than gasoline and diesel fuel on a per gallon equivalent basis nationwide. CNG vehicles emit significantly fewer pollutants than diesel

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[7] See Attachment A.
[8] DOE Clean Cities website: www.eere.energy.gov/cleancities
[9] Source: DOE's Energy Information Administration's "Alternative Fuels Estimated Data 2000", http://www.eia.doe.gov/cneaf/alternate/page/datatables/table4.html
[10] Note: figure does not include displacement from gasoline powered vehicles.

vehicles: 40% to 86% less PM and 38% to 58% less NO_X for heavy duty natural gas transit buses, school buses, refuse trucks and utility vehicles.

The major obstacles to the expanded use of CNG vehicles are their current higher cost compared to conventional diesel vehicles and the costs involved in establishing the infrastructure needed for refueling. Although these costs can be significant – for example the incremental cost of a CNG bus is approximately $25,000 to $40,000 more than a conventional diesel bus -- fleets can make a cost-effective transition to CNG by taking advantage of funding sources for alternative-fuel vehicle programs, such as Congestion Mitigation and Air Quality (CMAQ) grants, the US DOE State Energy Program (SEP) funds distributed through the national Clean Cities program and federal and State tax incentives.

Biodiesel is a cleaner-burning version of diesel fuel made from natural, renewable sources such as vegetable oils rather than petroleum. Biodiesel may be used as a blend fuel (as low as 5% to 20% biodiesel) or as a single neat fuel (100% biodiesel). Studies indicate that B100 and biodiesel blends generate less PM than conventional diesel (55% less PM from B100 and 18% less PM from B20), but more nitrogen oxides (6% more NO_X with B100) than 100% petroleum diesel[11] and 2-3% more NO_X with B20 (when engine tested by a dynamometer) than 100% petroleum diesel[12]. Recent tests by the National Renewable Energy Laboratory have shown a reduction in NO_X when the entire vehicle was tested under a load. Because biodiesel contains no sulfur, however, vehicles powered by this fuel can use advanced aftermarket emission control devices to further reduce harmful emissions.

Up until recently B100 biodiesel was as much as a dollar more than regular diesel fuel per gallon. In the last few months, due to federal legislation, the price of biodiesel has dropped to the same as regular diesel regardless of the blend percentage. Biodiesel blend fuels are increasingly popular because they can be used in conventional engines with few or no modifications.

Alternative Fuel Infrastructure

The eight states comprising the NESCAUM region have the following alternative fueling infrastructure:

As of 11/21/2005

NESCAUM REGION	CNG	E85	LPG	ELEC	BD	HY	LNG	Totals by State
Connecticut	11	0	19	4	1	0	0	35
Maine	0	0	12	0	3	0	0	15
Massachusetts	9	0	28	29	1	0	0	67
New Hampshire	0	0	19	8	11	0	0	38
New Jersey	18	0	14	0	1	0	0	33
New York	33	6	47	1	0	0	0	87
Rhode Island	6	0	4	1	0	0	0	11

[11] *Biodiesel, The Clean Green Fuel for Diesel Engines*, US Department of Energy, 2000, http://www.eere.energy.gov/cleancities/blends/pdfs/5450.pdf.

[12] *Biodiesel, The Clean Green Fuel for Diesel Engines*, US Department of Energy, 2000, http://www.eere.energy.gov/cleancities/blends/pdfs/5450.pdf.

Vermont	1	0	12	10	4	0	0	27
Totals by Fuel:	78	6	155	53	21	0	0	313

D. Evaluation of Anti-Idling Provisions

The DEP maintains regulatory authority that prohibits excessive idling of all motor vehicles. See the Regulations of Connecticut State Agencies section 22a-174-18(b)(3)(C) at: http://www.dep.state.ct.us/air2/regs/mainregs/sec18.pdf

DEP's anti-idling regulations apply to every vehicle in Connecticut, including heavy-duty diesel vehicles. Anti-idling programs provide a cost-effective and easy way to improve air quality and immediately reduce the exposure of people to the potential health impacts of diesel exhaust. Idling vehicles create emissions that contribute to the formation of smog and ground level ozone, and produce carbon dioxide (a greenhouse gas). Diesel exhaust even contains toxic air pollutants, including aldehydes (formaldehyde, acetaldehyde, acrolein), benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAHs). The United States Environmental Protection Agency (EPA) estimates that nationally diesel engines are the third largest source of fine particles, which can cause lung damage and aggravate respiratory conditions including asthma and bronchitis. These emissions can have a direct effect on the health of adults and children who inhale the exhaust.

Reducing diesel engine idling also saves money by conserving fuel and reducing engine wear. Because an idling engine is not operating at its optimal temperature, incomplete combustion occurs, allowing fuel residue to condense on engine parts like spark plugs and can even contaminate engine oil.

EPA is developing a "model" rule on anti-idling. About half of the country has state or local laws limiting the amount of time heavy-duty vehicles can idle, and many of these laws differ from location-to-location, making compliance especially difficult for truck drivers. The purpose of EPA's effort is to create more consistency in idling laws across the country. EPA's effort will inform states or localities as to the consensus view of what constitutes an effective and fair idling law.

In furtherance of this effort, EPA sponsored a meeting on July 26, 2005, in Hartford, Connecticut, to develop a model state idling law. Participants included representatives from states and local governments, trucking industry, and environmental and community groups.[13,14]

Compliance and outreach are vital to the success of any regulatory program. Constant reminders, such as anti-idling signs, significantly improve compliance rates with an idling restriction. Therefore, DEP is continuing its efforts to reduce unnecessary idling and increase awareness of the environmental and health effects of idling on schoolchildren, by providing free anti-idling signs to Connecticut public schools that agree to post them.

[13] This document summarizes the views and opinions of the participants who were working towards consensus on a model state idling law. http://www.dep.state.ct.us/air2/diesel/docs/epahartfordantiidlesummary.pdf

[14] The EPA presentation to initiate the meeting is provided as the second document. http://www.dep.state.ct.us/air2/diesel/docs/epaantidlelawdev.pdf

DEP has partnered with the Connecticut Department of Transportation to develop and post anti-idling signs at Connecticut rest areas to help increase awareness and compliance rates among truck drivers and the general public who visit these facilities.

Heavy-duty Idling Enforcement Case Study:

EPA announced on November 1, 2005 that Wal-Mart Stores Inc. (Wal-Mart) is taking steps to reduce diesel truck idling at its 4,000 facilities across the U.S. The anti-idling project results from a clean air enforcement action in Massachusetts and Connecticut brought by EPA's New England regional office.

Wal-Mart entered into the settlement based on EPA's complaint that Wal-Mart trucks were illegally idling at Wal-Mart stores in Massachusetts and Connecticut. In fall 2004, EPA inspectors observed trucks owned by Wal-Mart and by other trucking companies idling for long periods of time at six different Wal-Mart properties in Connecticut and Massachusetts. Inspectors observed delivery vehicles idling during the day as well as sleeper cabs idling at night. EPA's action signifies their intent to enforce idling regulations that are part of a state's federally enforceable air quality plans and is the country's first multi-state anti-idling case. The settlement agreement will result in Wal-Mart taking action across the country to address truck idling. Wal-Mart intends to train their drivers, post signs at all Wal-Mart facilities, and notify other delivery companies of Wal-Mart's policy to prohibit idling. Wal-Mart will also pay a modest civil penalty to the federal government.

According to EPA, a typical idling truck burns nearly a gallon of fuel per hour. A fleet of 7,000 trucks, about the size of Wal-Mart's fleet, idling for one hour a day would burn 2.1 million gallons of diesel fuel each year, and create 415 tons of smog-forming pollutants, 10 tons of harmful particulate matter, and 23,000 tons of carbon dioxide, which contributes to global climate change.

According to EPA, the following states and localities have anti-idling restrictions in place. The states with anti-idling restrictions include all or part of Arizona, California, Colorado, Connecticut, Delaware, Georgia, Hawaii, Maryland, Massachusetts, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New York, Pennsylvania, Texas, Utah and Virginia. Several states (including Massachusetts, Connecticut, Virginia, New Jersey, Hawaii and portions of Texas) have included these idling restrictions in their state implementation plan, making those rules federally-enforceable. Municipal governments that have developed anti-idling requirements to attain cleaner air include Maricopa County, AZ; Denver, CO; District of Columbia; Atlanta, GA; Owatonna and St. Cloud, MN; St. Louis, MO; Clark County and Washoe County, NV; New York City, NY; Allegheny County and Philadelphia, PA; Brazoria County, Chambers County, Fort Bend County, Galveston County, Harris County, Liberty County, Montgomery County and Waller County, TX; Salt Lake County, UT.

Several idle control technologies can aid fleets in limiting idling time and complying with state regulations. Automatic shutdown devices can switch off parked trucks after predetermined time intervals. Auxiliary Power Units (APUs) – which typically only consume between 0.05 and 0.2 gallons of fuel per hour – can provide heat, air conditioning, and power without running the main engine. Trucks can be fitted with devices that allow them to plug into electrical outlets to provide power and climate control for the cab when parked. These idle control devices typically have a

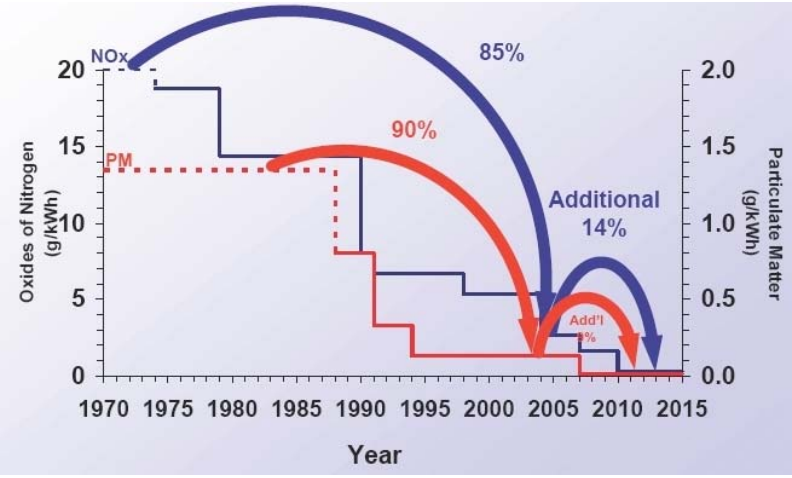
payback time of one to two years in fuel costs alone and can significantly reduce wear and tear on engines.

E. Identification and Evaluation of Leveraging Opportunities

The on-road fleets subcommittee sought to identify existing programs and/or funding streams for inclusion in the recommendations. This approach is based on fundamental reasoning that it is often more efficient to use limited resources to improve existing programs or re-direct existing funding streams rather than develop entirely new programs. As such, the following were identified as areas where possible leveraging opportunities exist:

1. Programs
   - On-road emissions testing of heavy-duty diesel vehicles HDDVs – tighter standards & wider applicability;
   - Anti-idling – greater outreach & stronger penalties; and
   - Implementation of federal emission standards for on-road HDDVs (fleet turnover);

Figure 2
U.S. On-Highway Emission Standards



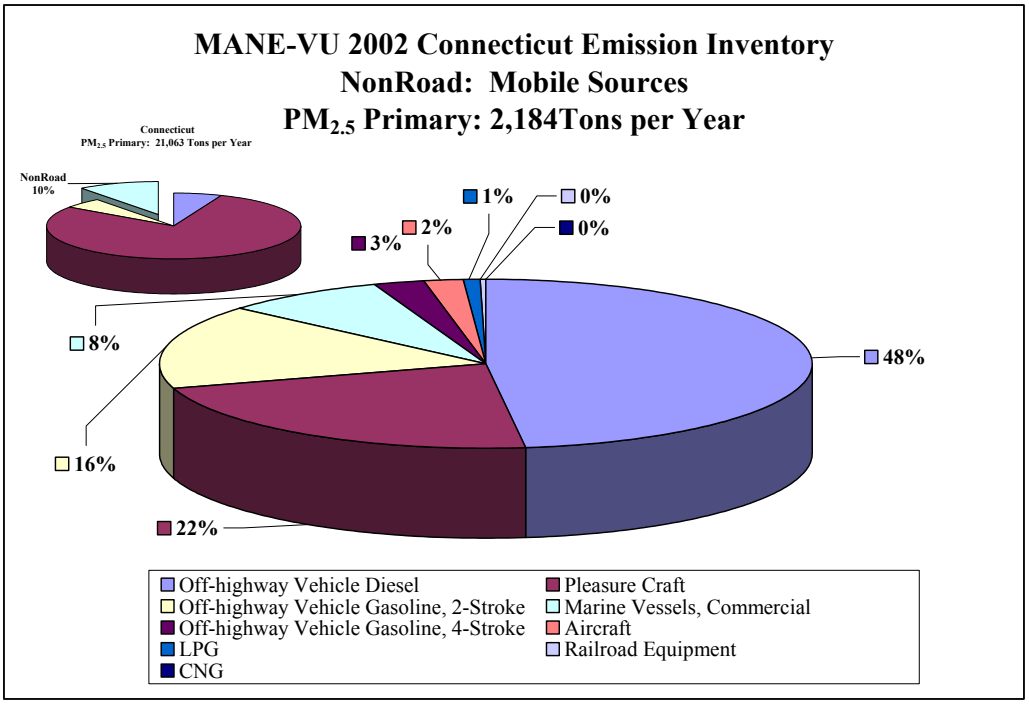
2. Funding
   - Fuel tax options to promote early use of ultra-low sulfur diesel (ULSD) fuel;
   - Tax incentives to promote purchase of new 2007 and later model year compliant HDDVs (fleet turnover); and
   - Seek funding from petroleum gross receipts tax – increased fuel prices have greatly increased funds collected under this tax.

F. Other Mobile Sources of Diesel Emissions

Two other sources, though not related to on-road fleets, were presented for consideration by the group: locomotives and marine diesel engines. There are three types of locomotive diesel engines: line-haul (e.g., freight), passenger and switch. Diesel marine applications include category 1 commercial vessels, such as police boats and fishing vessels; category 2 commercial vessels such as ferries and tugboats; and recreational vessels such as powerboats. According to the U.S. EPA, by 2030 locomotives and marine sources will emit 45% of national diesel PM emissions and 27% of national NO_X emissions. Furthermore, by 2007 the sulfur content of

locomotive and marine diesel fuel will be reduced to 500 parts per million (ppm). The sulfur content of this fuel will be further reduced to 15 ppm sulfur between 2012 and 2014.

Figure 3



A. Locomotives.

Diesel powered locomotives emit high rates of PM, NO_X and other hazardous air pollutants and are under-regulated relative to other mobile sources of air pollution. In some northeast states, over half of locomotive emissions come from commuter and passenger rail operations. According to MANE-VU Railroad equipment accounts for 1,048 tons or 48% of Connecticut's non-road mobile source emissions of PM per year. Because of this, reducing locomotive PM and NO_X is a priority in order to lower public exposure to these pollutants. Similarly, locomotives that spend a lot of time idling are also a significant health concern. Switcher locomotives spend up to eighty percent of their total operation time idling. This activity increases the exposure of diesel exhaust to surrounding community.

Local railroads include switching and terminal operations and small line-haul operators. Switch locomotives assemble and disassemble trains at local rail yards. Passenger rail in New Haven includes Amtrak's intercity service and commuter service provided by the DOT. While line-haul freight trains are the largest national source of locomotive emissions, commuter and switching operations may have significant local impact on air quality and public health. DEP has an evaluation underway to identify the most cost effective strategies for reducing emissions from locomotives. Since regulation of this sector is reserved to the federal government, locomotives would be a logical priority for voluntary reduction strategies and as a focus for funding. Newly adopted federal standards will reduce NO_X and diesel PM emissions from locomotives as follows:

1. Tier 0 Standards – new 2001 locomotives and rebuilds of 1973-2001 locomotives will reduce NO_X by 30-33%.

2. Tier 1 Standards – new 2002-04 locomotives will reduce NO_X by 50%.

3. Tier 2 Standards – new 2005 and subsequent locomotives will reduce NO_X by 60% and diesel PM by 50%.

Non-federal locomotive standards could include:

1. Locomotives operators could be made subject to an anti-idling standard. Pilot projects in CT and MA demonstrate that installation of auxiliary power units (APUs) can reduce idling fuel consumption by up to 85% - resulting in fuel savings up to 25,500 gallons per year.

2. A pilot demonstration project is underway in Boston to test a DOC on a commuter train. Diesel PM reductions are anticipated to be 15-35%.

3. The State of California has entered into a voluntary pollution reduction agreement[15] with Union Pacific Railroad Company and BNSF Railway Company to expeditiously implement a number of measures to reduce emissions from locomotives and rail yards in California. Such measures include:

- Installing idling reduction devices on California-based locomotives within 3 years;
- Phasing out non-essential idling by locomotives within six months;
- Identifying and repairing locomotives with excessive smoke; and
- Maximizing the use of ULSD (15 ppm sulfur) by January 1, 2007, six years before such fuel is required by federal regulation.

B. Marine Vessels (Ferries): MANE-VU data indicate that commercial marine equipment in Connecticut accounted for 175 tons or 8% of non-road mobile source emissions of PM in 2002. This is nearly six times the PM emissions from transit and school buses combined. Newly adopted federal standards for marine engines consist of several sets of emission standards, which vary based on engine size and fuel type. The standards apply to new gasoline and diesel powered marine engines manufactured after the effective date of the standards between 2004 and 2007. More detailed information on the federal marine diesel engine emission standards is available at: http://www.epa.gov/otaq/marine.htm

[15] The California Air Resource Board, upon considering the preemption issues raised by the Interstate Commerce Commission Termination Act of 1995 (ICCTA), determined there is a strong potential of preemption on any state or local regulation addressing locomotives. As such, CARB proceeded with a voluntary agreement.

III. On-Road Strategies

The current inventory is somewhat limited to develop detailed evaluation of fleet-wide emission reduction options. Prior to developing fleet specific emission reduction strategies and choosing an appropriate model for Connecticut, a complete inventory of on-road vehicles is needed, specifically including the following information:

- Number vehicles by fleet type;
- Vehicle owner and operating location;
- Engine model year and manufacturer; and
- General duty-cycle information.

A draft strategy for reducing emissions from waste haulers is included below although more research is necessary to fully evaluate implementation steps.

A. Strategies for near term implementation (building upon existing programs)

1. Expand on-road heavy-duty vehicle emissions testing program to include all vehicles between 10,001 and 25,999 pounds GVWR. These vehicles are currently exempt from emissions testing even though vehicles below and above this weight class are subject to emissions testing.

2. Expand anti-idling program through a combination of outreach and enhanced enforcement through legislative action to authorize municipal police officers to issue citations for violation of idling regulation.

3. Continue to apply for federal funding as it is made available for on-road heavy-duty diesel retrofits, truck stop electrification or truck stop auxiliary power units.

B. Strategies for mid-term implementation (leveraging opportunities)

1. Develop and implement a strategy to address waste haulers. These vehicles are numerous and widely operated in Connecticut. DEP should explore opportunities to leverage existing programs (e.g., solid waste permitting authority) to address air emission impacts of waste haulers.

2. Seek CMAQ funding for truck stop auxiliary power units (APUs) and for development of truck stop electrification (TSE) infrastructure.

3. Develop "Chip Re-flashing" regulations to require the installation of low-NO_X software in eligible HDDVs.

4. Develop a stand-alone anti-idling regulation incorporating provisions of EPA's model anti-idling rule.

5. Consider including OBD-equipped medium duty vehicles between 10,001 and 25,999 pounds GVWR into the bi-annual emissions testing program upon contract renewal.

C. Strategies for long-term implementation

1. Inventory locomotives and assess viability of retrofit technologies. Provided it is technically feasible and funding is available, proceed to retrofit.

2. Inventory marine Vessels (ferries) and assess viability of retrofit technologies. Provided it is technically feasible and funding is available, proceed to retrofit.

3. Inventory state and municipally owned heavy-duty diesel vehicles. Assess timeframe by which such fleets will be in compliance with federal 2007 emission standards.

However, based upon DEP's research and the input provided by stakeholders DEP has focused on waste haulers as a priority fleet and has developed several options for reducing emissions from waste haulers. Several reasons support the prioritization of waste haulers for retrofits. Typically this fleet:[16]

- Travels at low speeds and idle frequently in neighborhoods and commercial centers directly exposing people to their exhaust;
- Operates in significant numbers in urban areas where diesel emission reductions should be prioritized; and
- Is likely to be either publicly owned or privately owned but under public contract.

Option 1: Mandatory Retrofits for Waste Haulers

A mandatory retrofit program can be pursued through one of three mechanisms: a statutory requirement, adoption of new regulations or inclusion as a permit condition. These three approaches are discussed in more detail below.

- **Statutory Provision:** The General Assembly could craft legislation to require the installation of "best available control technology" (BACT) requirement. This is similar to the New York City model, under which an estimated 2,500 waste collection vehicles under city contract must use ULSD and meet a BACT standard by March 1, 2006 (publicly owned waste collection vehicles must implement BACT on a phase-in basis by 2012. In its memo, ENE projects that retrofitting all the SWCVs in the state with diesel particulate filters, the most effective and costly aftermarket emissions control technology, would cost up to $9 million and have a cumulative benefit of reducing up to 100 tons of PM emissions.[17] Emissions reductions from SWCVs could also be accomplished through implementation of new air quality regulations, as in California, or through permit conditions.
- **Turnover and Incentives:** As with other sectors, incentives to encourage early retirement and replacement of vehicles with cleaner SWCVs that comply with the 2007 standards could be very effective in reducing emissions of both PM and NO_X.
-

Option 2: Heavy Duty Diesel Inspection and Maintenance Program

[16] See Attachment A.
[17] ibid.

Expand on-road heavy-duty vehicle emissions testing program to include all vehicles between 10,001 and 25,999 pounds GVWR. These vehicles represent 42% of the fleet and are currently exempt from emissions testing even though vehicles below and above this weight class are subject to emissions testing.

Option 3: Anti-Idling and Truck Stop Electrification

DEP's anti-idling regulations apply to every vehicle in Connecticut, including heavy-duty diesel vehicles. Anti-idling programs provide a cost-effective and easy way to improve air quality and immediately reduce the exposure of people to the potential health impacts of diesel exhaust. Reducing diesel engine idling also saves money by conserving fuel and reducing engine wear. Enforcement capabilities need to be supplemented with broader police authority to ticket violators for excessive idling.

IV. Conclusion

Concluding statement on how to move forward with the recommendations and options presented above.

MEMO

To: **On-road Fleets Subcommittee**
From: **Madeleine Weil, Environment Northeast**
Date: **November 10, 2005**
Re: **Waste Collection Vehicle Options Memo**

Purpose

This memo outlines potential policy options for cleaning up waste collection vehicles in Connecticut. Feedback from the group regarding policy mechanisms, estimated costs and benefits, and implementation avenues is welcome as it will help improve assessment.

Background

Waste collection vehicles have been targeted for priority clean-up efforts by other jurisdictions engaged in comprehensive diesel emission reduction programs.

These jurisdictions have prioritized waste collection vehicles because they:

- Travel at low speeds and idle frequently in neighborhoods and commercial centers where people are directly exposed to exhaust;
- Operate in significant numbers in urban areas where reductions in diesel emissions should be prioritized; and
- Are likely to be publicly-owned, or privately-owned but publicly-contracted**.**

Clean Up Option Summaries

- California model – BACT mandate applies to all public and private waste collection fleets (est. 12,000 vehicles). Costs will be passed on to customers (estimated $1 per household per year). Mandate phased in through 2010;
- NJ model – BART mandate applies to all publicly-owned or publicly-contracted fleets (state, county, municipal, est. 2180 vehicles). Costs will be reimbursed by state "Diesel Risk Mitigation Fund;"
- NYC model – ULSD and BACT is required in the fulfillment of solid waste contracts or recyclable materials contracts with a city agency (est. 2,500 vehicles). Costs will be built into City contracts, contractors must comply by March 1, 2006. Publicly-owned diesel vehicles (including solid waste vehicles) must phase-in BACT between 2007 and 2012;

CT's Waste Collection Fleet

- For this options memo, it has been estimated that 1200 waste collection vehicles operate in Connecticut. This estimate is based on the DEP's observation that the California vehicle population can be used as a proxy, (the CT vehicle population is typically 1/10th the size of CA).[18]
- It is recommended that a complete inventory of waste collection vehicles in Connecticut be developed. This would include:
  - number of waste collection vehicles
  - engine vintage;
  - engine manufacturer;
  - ownership, (public/private);
  - location of fleet.

Priority Communities

Some communities in Connecticut are more at risk than others from elevated levels of $PM_{2.5}$. These communities should be prioritized for expedited emission reductions if resources do not permit immediate statewide implementation.

Option 1 – High PM Reductions: "Best-Available Control Technology" requirement, maximizes emission reductions on ALL waste collection vehicles by 2010 (based on CARB's Waste Collection Vehicle Regulation), see *www.arb.ca.gov/msprog/SWCV/SWCV.htm*.

Application:

- The requirement would apply to owners of waste collection vehicles.
  - An "owner" can be a private company operating independently or under contract, or a city, state or federal agency;
  - "Waste collection vehicles" are diesel-fueled trucks over 14,000 pounds used to collect residential or commercial solid waste or recyclable materials;

Compliance:

- How would owners comply with the BACT requirement?
  - Purchasing an engine certified to the 2007 model year PM standard of 0.01 g/bhp-hr
  - Installing an EPA/CARB-verified retrofit device that reduces PM by the greatest amount possible for the particular engine and application (see BACT levels below):
    - The right BACT retrofit device depends on if:
      - The device is certified for the engine;
      - The duty cycle of the vehicle matches requirements;
      - The engine warranty can not be voided by using the device.
    - Engines too old to be retrofitted need to be repowered so that an emission control device can be installed;
  - Using an alternative fuel engine, alone or in combination with one of the options above, that reduces PM at least as much as a BACT retrofit device.

What would qualify as a BACT retrofit device:

- "BACT" is a technology or clean fuel verified by the EPA or CARB to reduce particulate matter (PM). To qualify as "BACT," a fuel or technology must reduce the engine's PM to

[18] Paul Farrell, DEP, 9/8/05

the highest level possible. There are three levels of CARB-verified diesel emission control strategies:

- **Level 1** reduces PM at least 25%
- **Level 2** reduces PM at least 50%
- **Level 3** reduces PM at least 85% or reduces PM emissions to at least 0.01 g/bhp-hr

Costs:

- Assume owners are most likely to retrofit 1991-2006 engines with a passive DPF or a DOC.
  - A DPF would cost approximately $5,000 - $8,000 (including installation and backpressure monitor);
  - A DOC would cost $3,000 - $4,000 (including installation, no backpressure monitor necessary).
- Older engines may need to be repowered before they can be retrofitted with a DPF or a DOC.
  - The average cost of a repower is $45,000, with a range of $21,000 - $90,000. Total average cost, with a filter installation, would be about $50,000.
  - Alternatively, older engines can be replaced with new 2007-compliant diesel vehicles or alternative fuel vehicles.

How would costs be covered:

- Since waste collection is a fee-based activity, CARB expects vehicle owners to raise fees to pay for the costs of compliance. CARB expects municipalities and service providers to work together to amend or renegotiate contracts as needed so that service fees reflect the service providers costs for compliance.
- CARB estimates that total costs of compliance will average out to about $1 per household, statewide.

Timeframe:

- Implementation requirements are phased in through 2010, based on engine model year, see schedule to the right, (http://www.arb.ca.gov/diesel/factsheets/trashtruck.pdf);
- Compliance extensions are given for early implementation, and for engines that have no verified control strategies.

Enforcement:

- CARB will enforce the regulation through roadside inspections and visits to maintenance yards or terminals;
- Civil penalties will be assessed for non-compliance, and may range from $500 per day to $25,000 per day, depending on the violation.

Estimated Costs and Benefits in Connecticut:

Adopting a similar program in Connecticut would require BACT for an estimated 1200 waste haulers (the entire estimated population).

- Costs:
  - Assuming the highest level of BACT (a passive diesel particulate filter) is feasible for every truck, total estimated capital costs equal:

IMPLEMENTATION BY ENGINE MODEL YEARS

Group 1 **	1988 - 2002	DEADLINE
	10 % BACT	December 31, 2004
	25 % BACT	December 31, 2005
	50 % BACT	December 31, 2006
	100 % BACT	December 31, 2007
Group 2a *	1960 -87	(Fleets of 15 or more vehicles)
	15 % BACT	December 31, 2005
	40 % BACT	December 31, 2006
	60 % BACT	December 31, 2007
	80 % BACT	December 31, 2008
	100 % BACT	December 31, 2009
Group 2b **	1960 - 87	(Fleets of 14 or fewer vehicles)
	25 % BACT	December 31, 2007
	50 % BACT	December 31, 2008
	75 % BACT	December 31, 2009
	100 % BACT	December 31, 2010
Group 3 **	2003 - 06	(includes dual & bi-fuel engines)
	50 % BACT	December 31, 2009
	100 % BACT	December 31, 2010

* GROUP 2a: level 1 technology may not be used as BACT

** Owners with total fleets of 1-3 vehicles may delay compliance until the final deadline for each group.

- 1200 trucks * $7,500[19] = $9 million

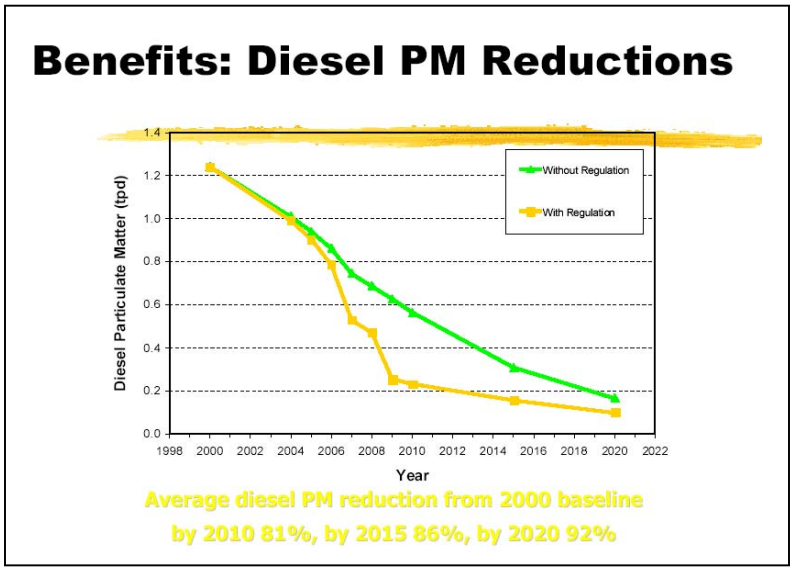
- Assuming that retrofits are phased in over four years between 2007, and 2010, the operating cost of cleaning filters equals:
  - 2008: 300 filters * $500[20] = $150,000
  - 2009: 600 filters * $500 = $300,000
  - 2010: 900 filters * $500 = $450,000
  - 2011: 1200 filters * $500 = $600,000
- Cost Caveats:

For some engines, particularly pre-2002 Mack engines, the BACT will be a wire mesh filter (or high-performance DOC) rather than a DPF. These installations are much cheaper, (estimated $3,000 versus $7,500) and they do not require annual filter cleanings.

- Under this option, owners would be required to repower waste collection trucks older than 1991 (average cost $50,000 per truck) or replace engines with new 2007-compliant models. It is not known how many older, pre-1991 trucks operate in Connecticut.

- Benefits:
  - Connecticut benefits pro-rated from CARB's benefit assessment (see chart below):

Benefits of CARB Waste Collection Vehicle Regulation



Connecticut waste collection emissions (tons per day)

	2010	2015
Without regulation	0.058	0.03
With regulation	0.022	0.016

- Estimated annual benefits of regulation in 2010: 13.14 tons PM reduced
- Estimate cumulative benefits of regulation: 100 tons PM reduced

[19] Cost of diesel particulate filter, installation, and backpressure monitor used in calculations by the Transit Bus subcommittee, based on CT Transit experience.
[20] Cost of annual filter cleaning used in calculations by the Transit Bus subcommittee, based on CT Transit experience.

California Contact:

- Richard Varenchik, California Air Resources Board, 626-575-6730

California Progress To Date:

The California Air Resources Board is currently preparing a progress report on implementation by Group 1 fleets subject to the December 31, 2004 deadline (see implementation chart on previous page). So far, they have received reports covering 8400 Group 1 vehicles. 3040 of these vehicles have been brought into compliance by the following means:

- 194 LNG (liquefied natural gas) vehicles
- 552 CNG (compressed natural gas) vehicles
- 1619 DOC (diesel oxidation catalyst) retrofits
- 676 DPF (diesel particulate filter) retrofits

Staff Reports on Implementation - (Richard Varenchik)

- When the rule came into effect in early 2004, a DOC qualified as BACT for many sanitation trucks because few DPFs had been verified at that time. Fleet owners rushed to retrofit with DOCs to avoid more costly DPFs. Now, DOCs would no longer be considered BACT for a large majority of sanitation trucks;
- The early compliance rule allows fleet owners to delay 100% implementation by two years (from 2007 to 2009) if they bring 50% of their fleet into compliance by July 2005. Several of the large fleet owners took this route by retrofitting 50% of their fleet with DOCs early in 2004 (before a variety of DPFs were verified);
- To staff's knowledge, no truck has been brought into compliance through a repower plus a retrofit. Instead, fleet owners are choosing to retire old trucks, or shift them to back-up duty. Trucks that are going to be retired in less than one year and back-up trucks are exempt under CARB's rule;
- Advice from Varenchik: Classifying the sanitation fleet into groups with separate implementation phase-in periods has made this rule difficult to administer. He recommends avoiding the group classifications by applying a standard phase-in schedule fleet-wide.

Option 2 – Medium PM Reductions: "Best-Available Retrofit Technology" requirement, maximizes emission reductions on waste collection vehicles that are publicly-owned or privately-owned but used in public contracts by 2010 (based on New Jersey's Waste Collection Vehicle Regulation), see *www.arb.ca.gov/msprog/SWCV/SWCV.htm*.

Application:

- The requirement would apply to any diesel solid waste vehicle registered in the State that is:
  - Owned by the State or any political subdivision thereof, or a county or municipality or any political subdivision thereof;
  - Owned by a person who has entered into a contract with the State or any political subdivision thereof, or a county or municipality or any political subdivision thereof, to provide solid waste services;

Compliance:

- Fleet owners would submit a "fleet retrofit plan" to the DEP that documents a BART determination for every regulated solid waste vehicle.

  - BART devices must be EPA/CARB verified, and reduce the engine's PM emissions by the highest feasible level (just like the CARB regulation above);
  - If BART is not feasible for a particular engine, an owner may negotiate an enforceable commitment to retire and replace the engine with a 2007-compliant vehicle, or an older vehicle with BART installed.
- More than one owner or a group of owners may submit a "combined-fleet retrofit plan."
- Any owner or group of owners of 75 or more regulate vehicles may submit to DEP a "fleet-averaging plan," as long as the net percentage reductions at least equal to the net reductions that would have been achieved through a fleet retrofit plan or a combined fleet retrofit plan.
- The DEP would be required to review, and approve or disapprove of fleet retrofit plans, and make determinations to fleet owners.

Costs and how they would be covered:
- Retrofit costs per vehicle are assumed to be the same as in California. However, New Jersey has explicitly said that no owner shall be required to repower or replace engines;
- Before retrofits installations are required, the NJ State Treasury must certify that money has been developed in the Diesel Risk Mitigation Fund and the DEP must certify that the money is sufficient to cover costs of the approved fleet retrofit plan;
- In New Jersey, the Diesel Risk Mitigation Fund is capitalized by a reallocation of a portion of the Corporate Business Tax currently dedicated to hazardous substance discharge remediation and underground storage tank upgrades.

Timeframe and Reporting:
- The legislation adopted this year in New Jersey gives the NJ DEP 270 days to adopt rules and regulations necessary for implementation;
- After these rules and regulations are adopted, owners of waste collection vehicles must submit an inventory and fleet retrofit plan to NJ DEP within 180 days;
- Each year, owners must submit a progress report and modifications to the fleet retrofit plan every year by the anniversary of the original submission.

Estimated Costs and Benefits in Connecticut:
Adopting a similar program in Connecticut would require BACT for an estimated 880 waste haulers (public and publicly-contracted vehicles, estimated number of vehicles pro-rated from New Jersey based on population).

- Costs:
  - Assuming the highest level of BACT (a passive diesel particulate filter) is feasible for every truck, total estimated capital costs equal:
    - 880 trucks * $7,500[21] = $6.6 million
  - Assuming that retrofits are phased in over four years between 2007 and 2010, the operating cost of cleaning filters equals:
    - 2008: 220 filters * $500[22] = $110,000
    - 2009: 440 filters * $500 = $220,000
    - 2010: 660 filters * $500 = $330,000

[21] Cost of diesel particulate filter, installation, and backpressure monitor used in calculations by the Transit Bus subcommittee, based on CT Transit experience.
[22] Cost of annual filter cleaning used in calculations by the Transit Bus subcommittee, based on CT Transit experience.

        - 2011: 880 filters * $500 = $440,000
    - Cost Caveats:
        - For some engines, particularly pre-2002 Mack engines, the BACT will be a wire mesh filter (or high-performance DOC) rather than a DPF. These installations are much cheaper, (estimated $3,000 versus $7,500) and they do not require annual filter cleanings.
        - Under this option, owners would not be required to repower, rebuild or replace engines, so no additional costs are expected for pre-1991 engines.
- Benefits:
    - Pro-rated from New Jersey DEP's benefit assessment (estimated annual benefit of 14 tons PM);
        - Estimated annual benefit of regulation in 2010: 5.6 tons PM reduced;
        - Estimate cumulative benefits of regulation: 42.9 tons PM reduced.

Option 3 – Lower PM Reductions: "Best-Available Retrofit Technology" requirement, maximizes emission reductions on waste collection vehicles that are owned by the state or used in state contracts by 2010 (based on New York City's waste collection vehicle policy, Local Laws 39 and 40), see:
http://www.nyccouncil.info/pdf_files/bills/law05039.pdf
http://www.nyccouncil.info/pdf_files/bills/law05040.pdf

Application:
- Would require the use of ultra-low sulfur diesel and best available retrofit technology in the fulfillment of solid waste contracts and recyclable materials contracts with any state agency;
    - State agency includes any subdivision of government for which expenses are paid in whole or in part from the state treasury;
- Would apply to contracts entered into or renewed after the policy becomes effective;
- Would require the use of ultra-low sulfur diesel and best available retrofit technology on all publicly-owned waste collection diesel vehicles.

Compliance:
- Any solid waste contract or recyclable materials contract let by any state agency would specify that all diesel fuel-powered vehicles used in the performance of the contract should utilize ULSD and BART – requirements would be noted in bid specification;
- Contractors would fulfill requirements by:
    - Utilizing vehicles with 2007-compliant engine models;
    - Installing BART, an EPA/CARB-verified emission control device that reduces the engine's PM emissions by the highest feasible level;
    - Using an alternative fuel engine, alone or in combination with one of the options above, that reduces PM at least as much as a BART retrofit device.
- No contractor would be required to replace BART for three years after the first installation;
- All contracts must permit independent monitoring of the contractor's compliance;

Reporting and Enforcement:
- Contractors must submit waste collection fleet retrofit reports to contracting agency and DEP;
- Because there is no good way to ensure that all contracted waste collection vehicles are regularly inspected, hefty penalty provisions could be used as a deterrent to non-compliance;

- New York City's law specifies that in the event of a violation, a civil penalty of not less than $1000 and not more than $10,000 will be assessed, in addition to twice the amount of money saved by such contractor for failure to comply. If a contractor has been found to have made a false claim, New York City may assess an additional civil penalty of $20,000.

Timeframe:

- Because this policy option applies only to state-contracted waste haulers, it could take effect shortly after its enactment (4 months, suggested);

Limitations:

- This proposed state-owned vehicle and state contracting policy should be considered a first step toward a broadly applied waste collection vehicle policy. Ultimately, municipal vehicles, municipally-contracted vehicles, and private vehicles need to be cleaned up to maximize emission reductions from this category of diesels.

Estimated Costs and Benefits in Connecticut:

The costs and benefits of this policy are unknown at this point because the number of waste collection vehicles contracted to fulfill solid waste and recyclable materials contracts with the state of Connecticut is unknown.

New York Contact:

- Spiro Kattan, Department of Sanitation New York (DSNY), 718-334-9205

New York Progress to Date:

All DSNY vehicles are now subject to Local Law 39 requiring BART for all city-owned and city-contracted diesels. Prior to adoption of the local laws, DSNY introduced a number of pilot projects testing various types of diesel emission retrofits. The information below pertains to these pre-local law pilot demonstration projects. So far, a variety of emission control retrofit systems have been installed:

- Donaldson DOC + Crankcase systems - 100 installations on MACK LE sanitation trucks;
- Johnson Matthey Fleetguard CCRTs - 50 installations on MACK LE sanitation trucks;
- Johnson Matthey Fleetguard CRTs - 100 installations on Cummins M11 with crane carrier cab chassis;
- Environmental Solutions Worldwide CWMF (catalyzed wire mesh filter) – 50 installations on MACK LE sanitation trucks;
- Englehard DPX – 30 installations on MACK LE sanitation trucks.

Staff Reports on Implementation - (Spiro Kattan)

- Pilot demonstrations have been very successful. DSNY is happy with retrofits and expertise gained through experience with several technologies;
- All projects have benefited from close working relationship between DSNY and technology vendors;
- Installations began with custom-design prototypes that were adapted to the application. Based on this experience, vendors developed plug and play kits that can now be applied to all vehicles of a similar model/vintage;

- Cummins M11s with CRTs have since been rotated out of the fleet. Some CRTs were relinquished with the vehicles, others have been removed with the vehicle and returned to Cummins for re-use;
- CCRTs on MACK LE trucks will be scheduled for a regular cleaning once per year. Originally, CCRTs were cleaned with compressed air, but now will be sent out to get baked (service procured through competitive bid process). Baking (Level 2 cleaning) recovers DPFs to 95% their original condition;
- Training implemented for technicians in all districts by product vendors;
- DSNY is now assessing how to move forward with BART mandates for all vehicles (sanitation trucks and others). BART will mean different technologies for different vehicles and duty cycles – no one size fits all in a large, diversified fleet like DSNY's. DSNY expects to comply with Local Law 39 by implementing additional retrofits and modernizing the fleet with MY2007 and newer trucks.